

able decrease in the vertical component magnetic field strength and an offset to the east in the location of the central magnetic anomaly. This segment is characterized also by a N164°E trending line of volcanic cones (65 m avg height, 1.1 km avg basal diameter). The Southern segment, in contrast to the linear Axial Ridge segment, has a more sinuous character that indicates more dispersed volcanic construction. The southern segment terminus can be traced as a 100-m high ridge into the Pagan Fracture Zone Trough.

The Northern Marianas Trough segment is less well documented because of the limited amount of SeaBeam and magnetic data. The trough axis is offset by 5 km to the east from the Axial Ridge segment, and dominated by a morphologic deep (5400 m at 18°36'N, 144°39'E) at its southern terminus (Figure 2, 4500 m depth contour). Magnetic structural boundaries (Figure 3b) are probably related to the extreme topography associated with the valley walls.

Rift Mountain Segmentation

To both the east and west of the Axial Ridge segment, two sets of axis-parallel rift mountain topographic highs can be identified (Figure 2, thick dashed lines). The features are similar in elevation and shape (several 100 m high, tapering and deepening toward the distal ends) to those of the Axial Ridge, and have a re-

markably constant across-axis spacing (8-11 km) that suggests a temporal variation in the processes that control ridge construction (either by magmatism and/or tectonic faulting). Assuming an average half-spreading rate of 15 mm/yr based on the observed width of the zone of normal magnetization, this spacing corresponds to a 0.5-0.7 Ma variation. Similarly-spaced rift mountain features are also present to the north and south of the segment boundaries (Figure 2).

The along-axis length of crestal mountain topographic highs also appears to be relatively constant (30-45 km) and shallowest toward the segment midpoint, revealing a spatial variation in the amount of the constructed topography or availability of magma. Furthermore, comparison of the locations of the ridge segments within the median valley with those inferred off-axis (rift mountains) shows that the segmentation boundaries are fixed in this study area. Regularly-spaced rift mountain topography coincident with the latitudes of inferred ridge segments is also characteristic of the slow-spreading Mid-Atlantic Ridge (e.g., MARK area, Kong et al., 1988).

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Sedimentary processes on the Kolbeinsey Ridge

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In 1988 a ridge-related joint project between GEOMAR, the Geological Institute (P. Stoffers), the Geophysical Institute and the Institute of Applied Physics (University of Kiel) began to investigate the geology of the Kolbeinsey Ridge north of Iceland. This project, called "The Greenland-Scotland Ridge: modern geodynamics of the world's ocean most important hot spot system", was funded by the German Ministry of Research and Technology. Termination of the project was December 31, 1990. Scientific interest was focused on the aseismic Iceland-Faeroe ridge and on the active mid-ocean ridge segment between Iceland and Jan-

Mayen (Kolbeinsey Ridge, Fig. 1).

As part of this project, scientists from GEOMAR focused on the investigation of sediment composition and distribution in the vicinity of the Kolbeinsey Ridge. Of pronounced interest were the relations between volcanic, hydrothermal, detritic and biogenic particle input and the resulting sedimentary deposits. Dating and correlation of sediment layers allowed us to reconstruct changing depositional process in space and time. Geochemical investigations have been used to elucidate elements or element groups suitable for characterizing these different depositional processes.

Investigations in the target area per-

formed during five expeditions led to a better understanding of depositional processes near the ridge crest. The geotectonic-structural character of the mid-ocean ridge as well as the oceanographic and climatic processes are highly important inter-regional factors influencing the depositional processes. Of more local importance are the morphological structure, depth and volcano-tectonic activities of ridge segments. In detail, ridge crest morphology and small-scale current systems which depend on this morphology play an important role by controlling sediment distribution patterns, sediment transport and the maintenance

nance of ecological niches for sessile benthos (foraminifers, sponges).

In the southernmost part of the Kolbeinsey Ridge, explosive volcanic activity, the appearance of which is highly dependent on water depth, provides the most important contribution to sedimentary deposition. North of the Spar Fracture Zone, deposition is mainly of pelagic character. The Spar Fracture Zone itself is characterized locally by typical sediments due to its extreme morphology. In addition, presumably hydrothermal processes in the vicinity of the Spar Fracture Zone and the southern Kolbeinsey Ridge caused remarkably high concentrations of As (up to

300 ppm) and Ba (up to 6000 ppm) at different stratigraphic levels. Recent low-temperature hydrothermal activity near Kolbeinsey Island leads to Fe-rich precipitates in this area (D. Stuben and P. Stoffers, pers. comm.).

Sediments sampled in regions distant from the ridge crest exhibit an increasing clay content occurring parallel to a color change from gray-black to olive-gray.

Between Iceland and ca. 68° N, sediment cores located west of the ridge axis exhibit a primarily pelagic succession of sandy-silty clays to sandy silts with typical dark-brown colors. East of the ridge crest, sediments are more olive-gray, which is re-

lated to higher portions of volcanic material.

Obviously, north of ca. 68° N the volcanic material is distributed less homogeneously over the ridge area, but is locally more concentrated on the western side. This is probably due to the complex hydrodynamic and oceanographic situation in this area.

The experiences from these investigations are the basis for future studies in the Reykjanes Ridge between 57° and 59° N (Fig. 1), starting in late 1991 (3-year study of "MOR sediments": financial support by the German Ministry of Research and Technology).

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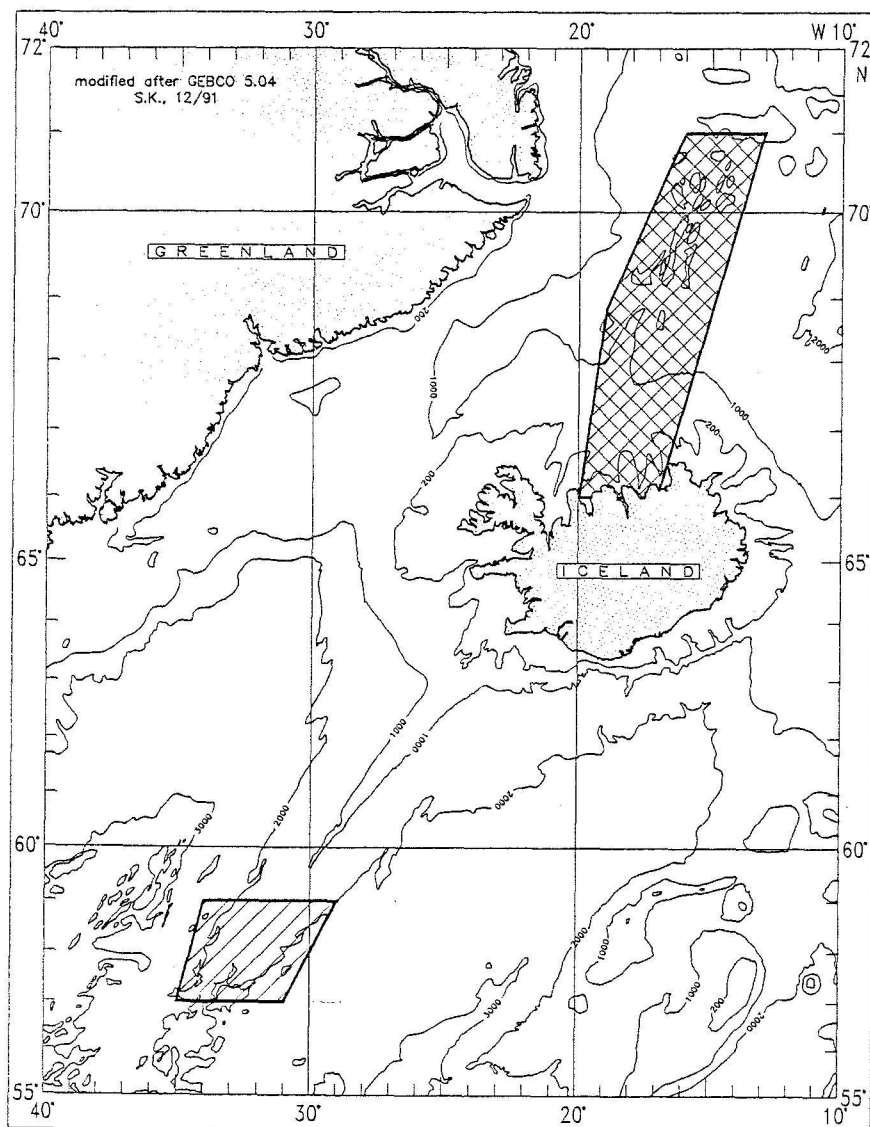


Figure 1. Area of investigation during the Greenland-Scotland Ridge Project 1988 - 1990 (Kolbeinsey Ridge, N. Iceland) and the location of the future study area on the southern Reykjanes ridge between 57° N and 59° N.